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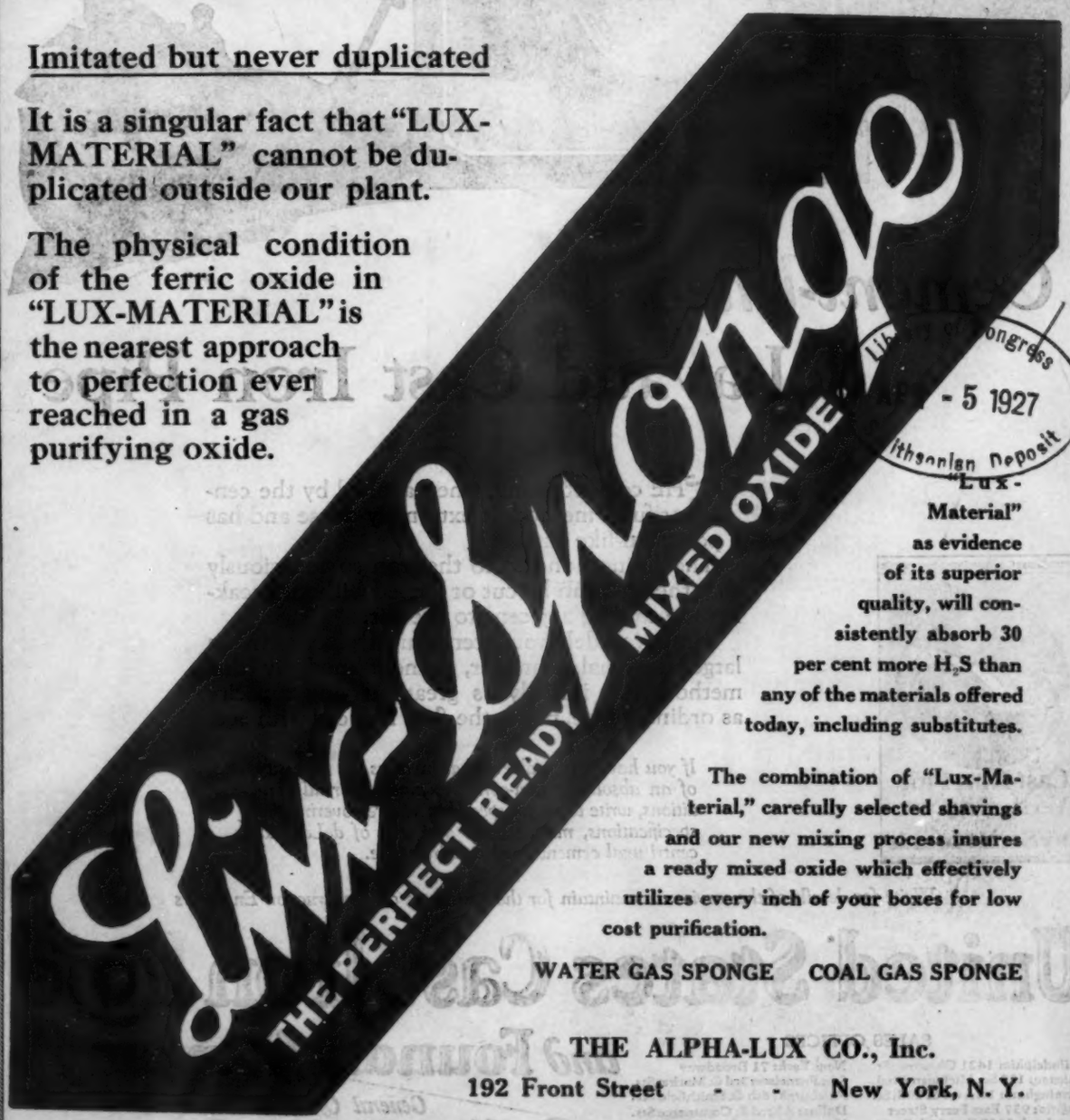

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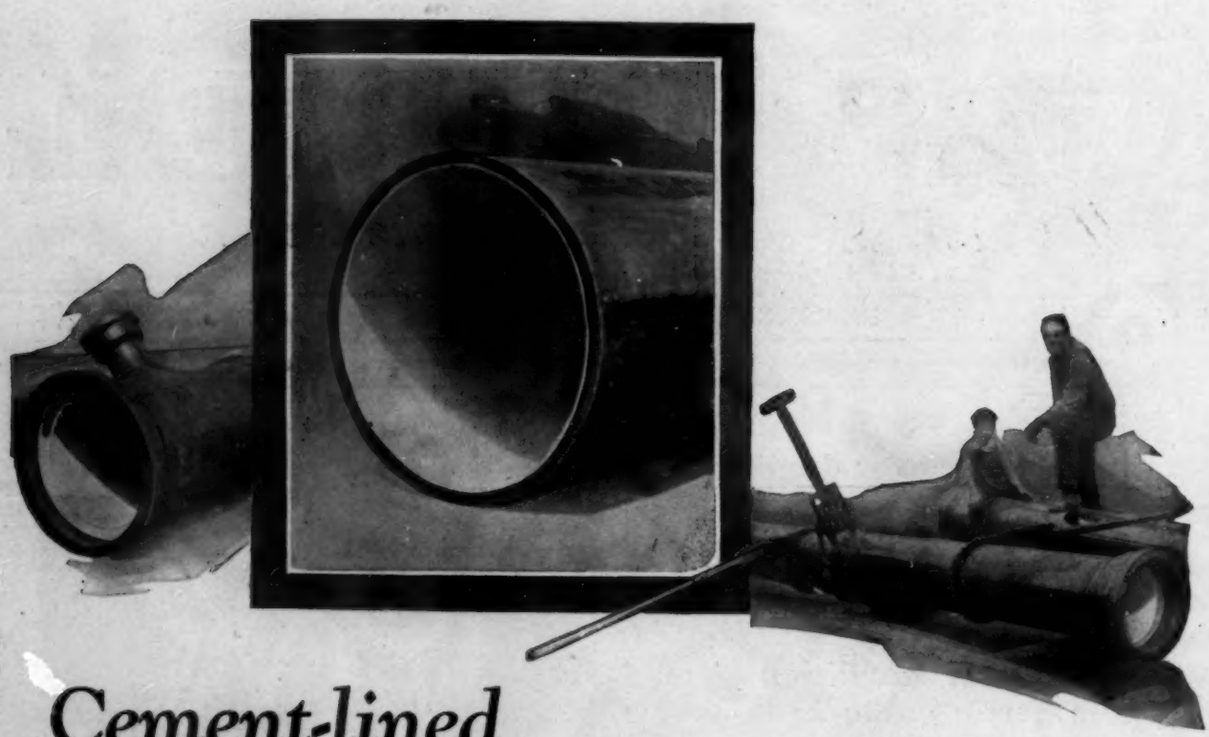

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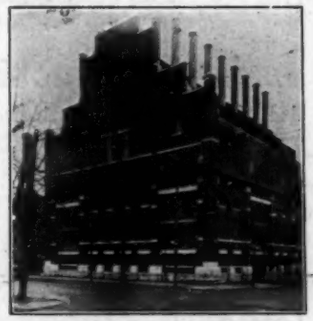

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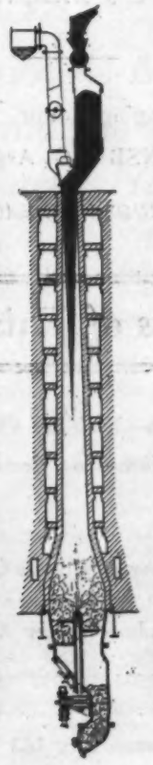

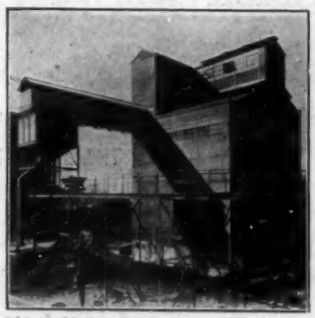

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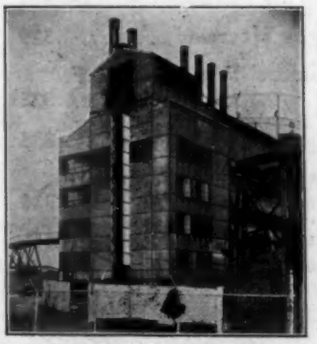

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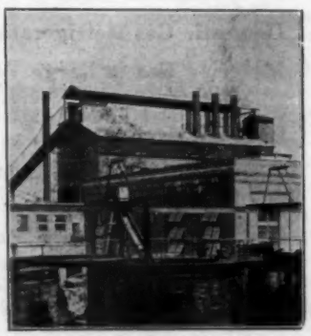

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Domestic Gas Refrigeration

A fundamental explanation of domestic refrigeration with mention of some gas-fired refrigerators

Nicholas Curtis Heyman, M.E.

THE manner in which the gas companies, undaunted by the inroads into their business made by electric lighting, turned toward other applications of gas, and avoided during that transitional period the disaster that was claimed to be inevitable, is unparalleled in any business enterprise. Since that time, the march of industry for new application of gas has been a series of successes. Gas utilization has become essential in almost every industry, but there never were as remarkable applications of gas in the gas fired absorption refrigerators. Before we delve into the merits of gas fired refrigerators, it is well to obtain a fundamental knowledge of refrigeration.

The Necessity of Refrigeration

Food is adversely affected by bacteria at temperatures that normally prevail in the homes. When exposed to atmosphere, food proceeds more or less rapidly towards decomposition and it is necessary to health that it should be consumed before it reaches the stage of incipient decay. Some of these micro-organisms are harmful to human health. It is therefore obvious that the problem of food preservation is to prevent or retard the growth of bacteria upon the foodstuffs that we intend to consume.

How to Exclude Bacteria

The problem of retarding the growth of bacteria is a very old one, and the most primitive method used to solve this problem is the drying method. In this method the food is subjected to a comparatively high temperature until all the moisture in the food is evaporated. This process is successful in retarding the growth of micro-organisms because moisture is essential to the growth of bacteria but in this drying process much of the food value of the product is destroyed. The lack of nourishing elements in food thusly treated more than counterbalances the exclusion of bacteria.

The second method of preserving food is by the use of chemical preservatives. The food is saturated with a chemical which destroys existing bacteria and prevents the development of other bacteria. The usefulness of this process is precarious. Medical opinion for many years has been divided as to the effect of chemical preservatives on the public health. The truth of the matter is that chemical preservatives affect different individuals to varying extents and the best precaution is to avoid chemically preserved foods. We therefore see that due to the limitations of this second method of food preservation, it is not very desirable.

The most efficient method of preserving food is by refrigeration. The word refrigeration means the lowering of the temperature of a body or a substance below the temperature of its surroundings by the extraction of heat from it. Due to the ever present heat losses such as radiation, the definition given above implies continuous heat extraction.

Ice Box Hazards

It is well to take up here the dangers of the present common ice box refrigerator. Perishable foods which have once been subjected to a freezing temperature become more readily susceptible to decomposition after the freezing process is discontinued. This is also true of foods that have been subjected to a fluctuating temperature. The third and most serious hazard of the domestic ice box is the moisture in the food storage space. When the ice melts, some of the resulting water saturates the air in the food storage space of the box.

As we have seen previously, moisture is essential to the growth of bacteria. Thus, it is obvious, that the domestic ice box fosters instead of retards the growth of bacteria as soon as the melting ice becomes inadequate for maintaining a low temperature. When the ice is first put into the box, a sufficiently low temperature is obtained, but when the ice melts away the temperature in the box rises and food preservation is hampered.

Methods of Producing Cold

There are numerous methods of absorbing heat. The most prevalent methods are as follows: First, when a substance changes from a solid to a liquid it absorbs heat from its surroundings, e.g., melting of ice. Second, when a substance changes from a liquid to a vapor it absorbs heat, for example, when one wets his hands with alcohol he experiences a cooling sensation. The reason for this is that the alcohol upon evaporating absorbs heat from the hands which causes the hands to experience a cooling effect. Third, when gas expands from a high pressure to a low pressure and in the process of expansion does work. This method of absorbing heat can be experienced by placing one's hands over the air coming from the valve of an automobile tire. This air feels cold because the expansion of the air from a high to a low pressure absorbs heat from the hands.

Elementary Mechanical Refrigeration

The mechanical domestic refrigerators on the market employ the second method of producing cold mentioned above, the change of a substance from a liquid to a vapor. There are two distinct types of machines that employ this method, the compression

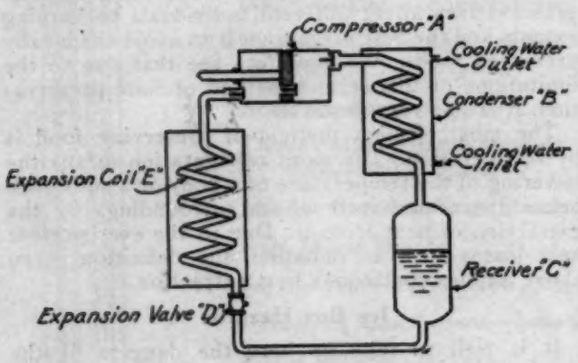


Fig. 1. Compression System

type and the absorption type. Figure 1 illustrates the elementary apparatus of the compression system of refrigeration which is employed in all electrical refrigerators on the market. A gas, known as the refrigerant, is compressed in compressor A. The compressed gas is cooled in condenser B by circulating cooling water as is shown in Fig. 1, or by air as in other construction of the same fundamental type of refrigerator. This cooling causes the refrigerant to liquify and collect in receiver C. The cooling effect can now be accomplished by causing the liquid to change to a vapor. This is done by reducing the pressure on the liquid by means of the expansion valve D. The liquid ammonia vaporizes and expands in expansion coil E which is in the ice box. The actual apparatus employed in the compression type of refrigerators is much more complicated, with many more moving parts than is shown in the elementary apparatus, Fig. 1. The disadvantages of refrigeration by compression are as follows:

Due to the existence of moving parts there will be wear and eventual necessity of replacements of parts; the noise of the running motor will increase with usage; there may be loss of the refrigerant through the gland of the compressor or other connections of the unit; there might be trouble from the belt drive between the motor and the compressor; and the control of the expansion valve by means of a ball float seems to be a weak construction.

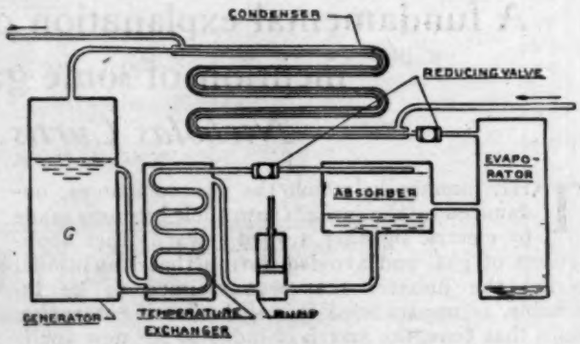


Fig. 2. Continuous Absorption Type

Figure 2 shows the elementary apparatus of a continuous absorption type of refrigerator. Ammonia gas dissolved in a solvent, usually water, is contained in the generator G. The generator G is heated, and the ammonia gas in the generator is driven off from the strong ammonia liquor (water with a comparatively large volume of ammonia gas dissolved in it). The ammonia gas is cooled in the condensor by cooling water circulated in a pipe concentric with the one carrying ammonia gas. By means of this cooling the ammonia is liquified. The cooling effect sought can now be produced by causing this liquid ammonia to evaporate. This is accomplished by means of a reducing valve and the resulting ammonia gas enters the evaporator and then the absorber. The weak liquor (low percentage of dissolved ammonia gas) which is heavier than strong ammonia liquor and is therefore at the bottom of the generator, is sprayed through a reducing valve into the absorber. This weak liquor absorbs the ammonia gas and becomes strong liquor (high percentage of dissolved ammonia gas). This strong liquor is then pumped back into the generator. The cycle is thus completed. The evaporator is the piece of apparatus that is placed in the ice box.

Because of the presence of intermittent absorption machines on the market we will briefly discuss the operation of one as depicted by the elementary apparatus shown in Fig. 3.

Strong ammonia liquor that is contained in generator A is heated by a gas burner G. This drives off ammonia gas into the rectifier B. The purpose

of the rectifier which is water cooled is to condense any water vapor that is driven off with the ammonia gas and to return it to the generator. From the rectifier the gas goes to the condensor where it is further cooled causing eventual liquefication. The liquid ammonia is collected in receiver E. To obtain refrigeration we have to change the liquid to a gas.

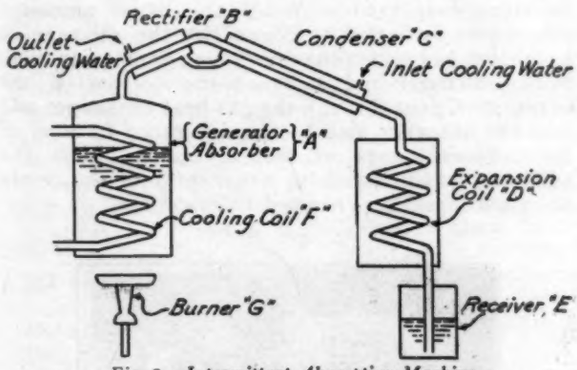


Fig. 3. Intermittent Absorption Machine
(The expansion coil and receiver are placed in the refrigerating box.)

This is done by shutting off the gas burner G and diverting the cooling water from the rectifier and condenser to the coil F. This cooling water cools the weak liquor in the generator and absorption of ammonia gas is made possible. The ammonia gas in contact with the surface of the weak liquor now in the generator, is absorbed by the weak liquor and a reduction of pressure is produced throughout the whole system. The liquid ammonia evaporates from receiver E and expands in the expansion coil D thus absorbing heat (change from liquid to a vapor). The generator A now acts as an absorber until the receiver E is again empty. A mechanism must, at that time, again turn on the gas and redivert the circulating water to the rectifier and condenser. The cycle is thus completed. It is obvious that in this system we have a heating period and a cooling period instead of a steady low temperature. The disadvantages of this type of refrigerator would seem to be the complications of the controlling mechanism, the gas pilot required and the cooling of the generator, which is limited by the temperature and flow of the cooling water.

On the other hand, the actual units are very compact, noiseless and can be located in any convenient place outside of the refrigerator box.

The Electrolux-Servel

Figure 4 shows the Electrolux-Servel gas fired refrigerator. Referring to Fig. 4, the strong liquor in the generator is heated by a gas flame. This drives off the ammonia gas and some water vapor. The water vapor is condensed by the rectifier and is re-

A—Strong ammonia liquor

B—Liquid ammonia

C—Weak ammonia liquor

D—Ammonia gas

E—Hydrogen gas

F—Ammonia and hydrogen gas

G—Cooling water

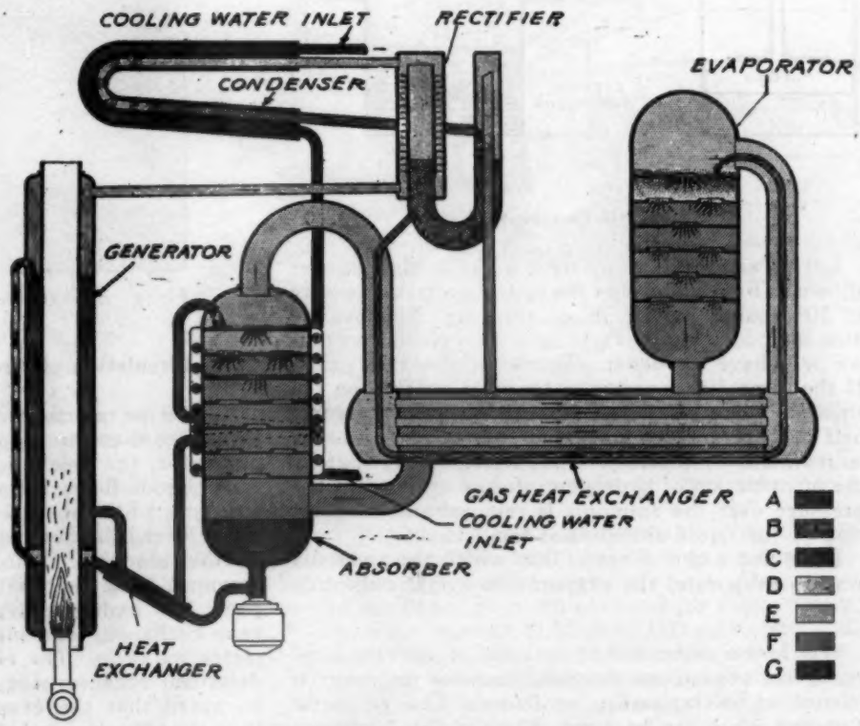
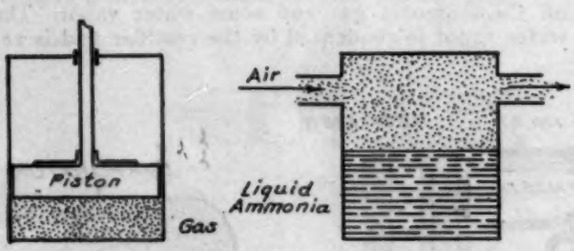


Fig. 4 Electrolux-Servel System

turned to the generator. The rectifier is kept at a definite temperature by the evaporation of the liquid ammonia that is in the U bottom of the rectifier. If the temperature in the rectifier rises the evaporation of the liquid ammonia increases and thus reduces the rectifier temperature. From the rectifier the ammonia gas goes through the water cooled condenser which cools the gas sufficiently for it to liquify. The liquid ammonia then flows back into the rectifier where it maintains the rectifier at a constant temperature. The liquid ammonia accumulates in the rectifier. As the liquid level in the rectifier becomes higher than the top of the inlet pipe into the evaporator, the liquid ammonia flows from the rectifier through the gas heat exchanger and into the evaporator. As has been stated in the other types of refrigerators, it is now necessary to cause this liquid to change to a vapor in order to obtain the cooling effect required. In the other refrigerators explained the evaporation was accomplished by a reduction in pressure over the liquid ammonia. This reduction in pressure is accomplished by introducing an inert gas, hydrogen, into the evaporator. At first it is difficult to visualize how the introduction of hydrogen would reduce the vapor pressure but the following explanation will aid in clearing up this point.



Graphic Description

Let us assume that we have a gas in the cylinder shown in Fig. 5a and that the piston exerts a pressure of 100 pounds per sq. in. on this gas. Suppose we now introduce another gas into the cylinder so that we will have an equal mixture of the two gases. If the same 100 pounds per sq. in. is exerted on the equal mixture of the gases each gas must assume half the pressure of 50 pounds per sq. in. in order to maintain equilibrium. Thus it is obvious that by the introduction of hydrogen into the evaporator the pressure over the ammonia is reduced and evaporation of the liquid ammonia is facilitated.*

If we had a closed vessel into which the ammonia was to evaporate, the evaporation would only continue until the space above the liquid ammonia was saturated. If we now cut two holes in the sides of the container as shown in Fig. 5b and cause a current of air to carry away the ammonia vapor, evaporation would continue until all the liquid ammonia would vaporize. In the Electrolux-Servel this circulation is accomplished as follows: Hydrogen is placed in the evaporator to cause a reduction in pressure and facilitate evaporation. When the liquid ammonia evaporates into the hydrogen gas the mixture of hydrogen gas and ammonia vapor is heavier than hydrogen itself and sinks to the bottom of the evaporator, goes through the gas heat exchanger and into the absorber, due to the difference in level of the different parts of the apparatus. Thus the ammonia vapor particles are removed and more ammonia liquid is permitted to evaporate.

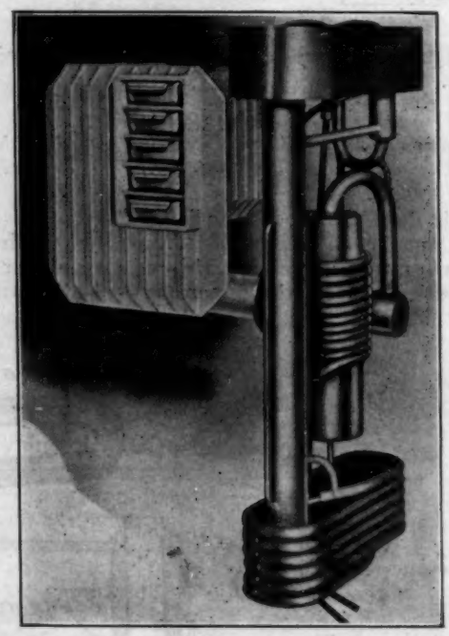


Fig. 6. Electrolux-Servel Refrigerator Unit

Circulation of Ammonia and Hydrogen

It must be remembered that weak ammonia liquor is heavier than strong ammonia liquor. Thus in the generator, the weak liquor is at the bottom. This weak liquor flows through the heat exchanger and to the top of the absorber by gravity as the generator liquid level is higher than the top of the pipe leading to the absorber. This weak liquor absorbs the ammonia from the mixture of ammonia and hydrogen. The hydrogen travels back through the gas heat exchanger and into the evaporator and completes its cycle. The circulation of hydrogen is as described because of a number of reasons. It can be noted that the evaporator is at a higher level than the absorber and since hydrogen is a very light gas (weighing only .09 grams per liter) it tends to

* For further explanation of the action of hydrogen in reducing the pressure on the liquid ammonia the reader is referred to an explanation of Dalton's Law of Partial Pressures which can be found in any chemical reference book.

rise. The circulation of hydrogen, down in the evaporator and up in the absorber, is also due to the fact that in the evaporator we have ammonia gas and hydrogen and in the absorber we only have hydrogen which is lighter than the mixture in the evaporator.

As a result of the absorption of the ammonia gas by the weak liquor we now have strong liquor at the bottom of the absorber. The strong liquor flows by gravity through the heat exchanger and into the thermo-syphon which is at the bottom of the generator. The thermo-syphon which is nothing more than a common percolator, transfers the strong ammonia liquor back to the top of the generator. This pumping action is accomplished by heating the strong liquor with the same gas flame employed in heating the liquor in the generator. Upon heating it, some ammonia gas is driven off and in the tube on the extreme left of the generator we have alternate bubbles of ammonia gas and ammonia liquor which rises to the top of the generator. The cycle of operation of the entire unit is thus completed.

1. The unit does not contain any mechanical device or moving part. This precludes the necessity of replacement of parts and servicing.

2. The refrigeration is continuous and any desired temperature within the limits necessary for food preservation can be obtained by use of the adjustable thermostat provided with the refrigerator.

3. It is absolutely safe under all conditions of operation. If the cooling water is shut off for any reason, refrigeration is stopped and the apparatus reaches a point where the heat supplied is equal to the heat radiated from the surfaces of the unit. The unit was so proportioned in area of radiating surface to conform with the formula:

Heat supplied = Heat radiated = K A (T—t) where K is a constant, A the area of the radiating surfaces, and (T—t) is the temperature difference between the unit and the room.

4. The installation of the refrigerator is very simple, requiring only a gas connection, and two water connections, inlet and outlet. The unit is very compact as is shown by Fig. 6.

1—*Generator cover*
2—*Generator*
3—*Flue*
4—*Thermostatic safety pilot*
5—*Gas burner*
6—*Magnetic gas valve*
7—*Gas entry*
8—*Motor switch*
9—*Water entry*
10—*Water valve*
11—*Ice tray*
12—*Water drain*
13—*Water drain*
14—*Generator inlet and outlet*
15—*Check valve, out*
16—*Check valve, in*
17—*Water regulator*
18—*Water jacket condenser*
19—*Liquid valve*
20—*Float contactor*
21—*Refrigerating chamber and coil*
22—*Brine tank*
Shaded portion—ammonia system

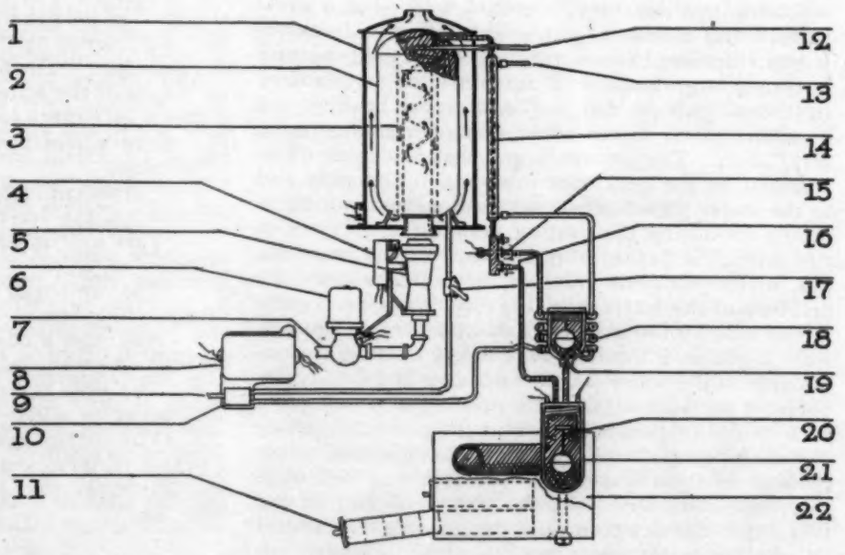


Fig. 7. Ice-O-Lator Unit

It must be remembered that we have continuous refrigeration. The various processes described in the cycle are continuous.

The cooling water circulates in copper pipes around the absorber and also around the condenser pipes. The heat exchangers employed increase the efficiency of the apparatus. The purpose of the heat exchangers is to cool the liquid or gas that has to be cooled by means of a cold liquid or gas that has to be heated in the course of the operation of the unit.

Advantages

The advantages of this refrigerator are too numerous to mention here and only the most important ones are listed below:

5. The operating cost of the Electrolux-Servel is very reasonable as can be seen from the costs listed below:

The maximum efficiency of this Electrolux-Servel refrigerator is obtained with a gas consumption of about 2.5 cubic feet of gas per hour. About 4 gallons of water are required per hour for cooling purposes. At a gas rate of $1.15 per 1,000 cubic feet and at a water rate of $1.00 per 1,000 cubic feet of water the gas cost will be $2.07 per month and the water cost will be $.40 per month. Thus making a total cost per month of $2.47.

What is obtained for the low rate of $2.47 per month? The answer is astounding. For this small

cost, 75 pounds of ice melting effect is produced per day of 24 hours. In view of the fact that 75 pounds of ice melting effect is not required by the average family, the cost per month will be materially reduced. This reduction in cost of operation is made possible by the thermostat that is included as part of the refrigerator.

The Ice-O-Lator

In competition with the Electrolux-Servel refrigerator we have the Ice-O-Lator, which is manufactured by the National Refrigerating Company of New Haven, Conn. This refrigerator does away with a few of the objections voiced against the Electrolux-Servel but it incorporates a few disadvantages.

Fig. 7 shows a diagrammatic sketch of the Ice-O-Lator unit. Its operation can be understood from the detailed description of the operation of the elementary type of intermittent absorption machine (Fig. 3), but an explanation of its operation will be repeated here. The generator in Fig. 7 is filled with a solid anhydrous (dry) material which has a great affinity for ammonia gas. This affinity decreases with an increase in temperature. When the generator is cool a large amount of ammonia gas is dissolved in the absorbent material and upon heating the ammonia gas is driven off in a manner analogous to distillation. The ammonia gas that is driven off is confined to the generator inlet and outlet pipe and to the water jacket condenser. As more ammonia is driven off during the heating period, the pressure in the ammonia passages increases. When ammonia gas, under sufficient pressure, is cooled to the temperature of the water from the city mains, as is done in this case by the water jacket condenser, it changes from a gas to a liquid. This liquid ammonia accumulates in the water jacket condenser and eventually operates the float controlled liquid valve, which valve permits only liquid ammonia to enter the refrigerating chamber and coil. Liquid ammonia thus accumulates in the refrigerating chamber and coil until the float contactor closes the electric circuit of the two upper contact points. Upon closing this circuit an electric motor switch is operated. This switch closes the gas supply by means of the magnetic gas valve and opens a water valve, permitting cooling water to circulate through a coil in the generator.

Distillation Continues Ten Minutes

Distillation of ammonia gas from the absorbent material continues for about ten minutes after the gas supply is closed. As soon as the circulating water cools the absorbent material sufficiently, its affinity for ammonia gas is restored and absorption instead of distillation takes place. The ammonia gas that is in the immediate contact with the absorbent material is absorbed and a reduction in pressure is produced throughout the whole system. This reduction in pressure facilitates the evaporation of the liquid ammonia from the refrigerating chamber and coil. This evaporation produces the cooling effect required. (The change of a substance from a liquid to a vapor absorbs heat from its surroundings.)

The ammonia liquid evaporated from the refrigerating chamber and coil and absorbed in the generator until the float contactor closes the circuit of the two lower contact points. The closing of this circuit actuates the motor switch in such a way as to open the gas supply and close the water valve. The gas is ignited by means of a thermostatic pilot and the heating period is started, thus beginning the cycle of operations again.

Back Pressure Obviated

Distillation of the ammonia gas is accomplished in about forty-five minutes and absorption is from two to six hours, depending upon the amount of refrigeration required.

During the absorption of the ammonia gas heat is generated. To avoid a back pressure that would be created by this heat, and would eventually stop the vaporization of the liquid ammonia, a water coil is placed in the generator. Thus the speed of absorption is governed by the flow of cooling water through the generator. The flow of cooling water is regulated by means of the water regulator shown in Fig. 7. In places where there are great variations in the climate this valve would have to be manipulated according to seasons.

The apparent advantages and the advantages claimed for the Ice-O-Lator are as follows:

1. This unit is adaptable to large-sized refrigerators.
2. The unit can be installed in any standard refrigerating box.
3. Although a control mechanism is necessary, it seems to be very reliable and silent.
4. The unit is very compact. It (Model G-10) only occupies about a square foot of floor space.
5. The cost of operation in scores of homes over a period of three years has proven, according to the manufacturers, that Ice-O-Lator operation is cheaper than ice.

The Sorco Iceless Refrigerator

The Sorco Iceless Refrigerator is another competing gas fired intermittent absorption machine. The operation of this refrigerator is somewhat similar to that of the Ice-O-Lator. The unit is very compact. It is usually placed outside of and above the refrigerator box with a liquid ammonia tank and a series of pipes extending down into and to the rear of the food storage space. The refrigerant used in this unit is ammonia gas dissolved in water. The series of pipes that extends into the food storage space is employed for the purpose of recovering the water that is driven off with the ammonia gas during the heating period. There are no moving parts in the path of the refrigerant of this unit. The controlling device is an automatic pressure control which controls the gas burner and the cooling water.

Metering Gas in Large Volumes on Consumer's Premises*

Space saving, accuracy and other advantages of rotary displacement meters

C. F. Ribley

Gas Superintendent, Adirondack Power and Light Corporation.

MANY different types of meters have been used for measuring large volumes of gas, all of which present problems well known to those in the gas industry. No means have yet been devised which solves all of these problems, thus removing them as problems in the industry. There are many factors involved. Most of these factors vary continually. Many meters, as known to the industry in the past, fail in the full realization of their purpose because of the variation of one or more of the factors involved separately or in combination, such as volume, rate of flow and time, temperature, pressure, impurities, density, moisture content, corrosion, electric current, water, oil recording, indicating, integrating and compensating devices, and the like.

This paper deals particularly with the measurement of gas by displacement, by the use of the two-impeller type rotary displacement meter. You are all more or less familiar with the two-impeller type of rotary blowers, exhausters and pumps, with impellers formed by mathematical curves of the cycloidal or involute types. All of these machines are, in fact, pumps or compressors. The power is applied to one or both shafts for the purpose of rotating the impellers and compressing the gas. The object of this type of compressor or pump is to move the fluid and produce a desired differential pressure between the inlet and outlet of the unit, in many applications of which the differential pressure is relatively high. This adds energy to the gas or fluid. The leakage from the delivery side to the suction side on this type of machine has a definite relation to the differential pressure, and also varies with the clearances in each particular machine.

Operation of Rotary Displacement Meter

The rotary displacement meter is the reverse in principle of the gas pump type of equipment. The pressure of the gas supplies the necessary energy to move each of the two-impellers which are maintained in proper relation by narrow faced timing gears. The gas does a small amount of work and thus becomes the motive power. The bearings are of the anti-friction type, four in number, located at the respective ends of the two shafts, out of the zone of the gas flow, thus being protected against the damaging action of the gas and insuring lubrication. The motive power to operate this meter is negligible because it is only necessary to overcome the friction of the bearings and the timing gears and to drive the counter.

These meters are driven by the flow of gas and are constructed so that they rotate very freely. The impellers do not touch each other or the surrounding case. The clearances are very small and uniform, which results in only a slight leakage of gas in the same direction as the gas flow. This leakage is generally known as the "slip." The resulting differential pressure across the meter is so low that this leakage follows the law of viscous flow rather than the law of flow through an orifice. The tips of the impellers approach a speed nearly equal to the theoretical velocity of the flowing gas, which further reduces the leakage to a very small amount.

No Water Seal Required

These meters do not require any water as a seal so that accurate readings for the temperature of the gas as it passes through the meter can be obtained. The parts used in the construction have been designed to reduce to a minimum the friction load required for their operation. The resultant differential pressure will range from approximately one inch water column at heavy loads on an average size meter down to less than one-tenth of an inch water column at low rates of flow through the meter. With these low differential pressures, and with the small uniform clearance, the amount of gas which slips past the impeller, over and above that which has been displaced by the impellers is only a fraction of one per cent of the gas flow through the recommended range of medium and large size meters. The average slip is geared into the counter so that the operator, if desiring extreme accuracy, needs only to take account of the variation in the slip, which will be discussed more in detail later in this paper.

It will be interesting to note that the displacement of the two-impeller type meter is a theoretical amount and that it can be calibrated as accurately as the volume of a cylinder. Irregularities in the shape of the impellers do not affect the displacement, but only modify the slip, which is determined experimentally by the builder.

After the volume has been determined for one size meter, the volume of all other meters having impellers with involute curves of the same per cent base circle will vary as the square of the pitch diam-

* Paper read at annual meeting, Gas Section, Empire State Gas and Electric Association, March 10th and 11th, 1927, Briarcliff Lodge, Westchester County, N. Y.

eter, hence the ease with which the displacement of all these meters can be calculated after one size has been accurately checked.

Since the displacement is a theoretical quantity, it never changes. Therefore, the only check that needs to be made on a rotary displacement meter is that for slip. The meters are made for top inlet and bottom discharge, so that the scraping action of the impellers against themselves and the surrounding case is such as to cause the deposits to fall below and be drained off in the usual drips. The scraping action keeps the deposits from building up as might be expected, thus keeping the slip nearly constant.

These mathematical calculations have been checked by the use of a plamineter, by water displacement of a theoretical impeller, also by a 20 cu. ft. gas prover and by wet drum tests. Another method is by comparing it with other meters which have been calibrated. A small rotary displacement meter can be checked with a prover for both slip and capacity, and also for the total of each. This small calibrated meter can be used for checking the capacity of the larger meters.

Gas Measured Up to 50 lbs. Per Square Inch

After a meter is constructed in the shops, no adjustment can be made to change the displacement. The impeller pockets must fill in order to cause rotation, and, therefore, some meters have been observed to operate, on short peak loads, as high as 200 per cent of their normal ratings without sacrificing accuracy. As these meters measure on the displacement basis, the volume of gas as it passes through the meter, irrespective of the pressure at which it passes, is measured. Meters of this type are measuring gas, in many places, at various pressures, up to 50 lbs. per square inch.

Throughout the land these meters are used very generally as station meters. These meters are not only used extensively as station meters, but are also used to measure the gas sold between companies buying and selling gas to each other. Outside of New York State these meters are also being used as consumers' meters where the normal consumption is as low as several thousand cu. ft. of gas per hour.

Fig. (1) shows a typical counter calibration curve on a meter, the normal rating of which is 62,000 cu. ft. per hour. The number of cu. ft. per hour to be added to or subtracted from the counter readings corresponds to the rate of flow as shown on the calibration curve. These are taken from shop tests. This curve takes into account the variation in the slip previously mentioned in this paper, and also shows that at the approximate rate of 16,000 cu. ft. per hour no correction is to be made for slip. When running at the rate of 62,000 cu. ft. per hour the counter registers fast by 65 cu. ft., which means a correction of a little over one-tenth of one per cent. Assuming that no correction is made when passing gas at the rate of 100,000 cu. ft. per hour, the meter will thus be 99 9/10 per cent accurate. Referring to the low rates of flow as per Fig. (1), it is noted

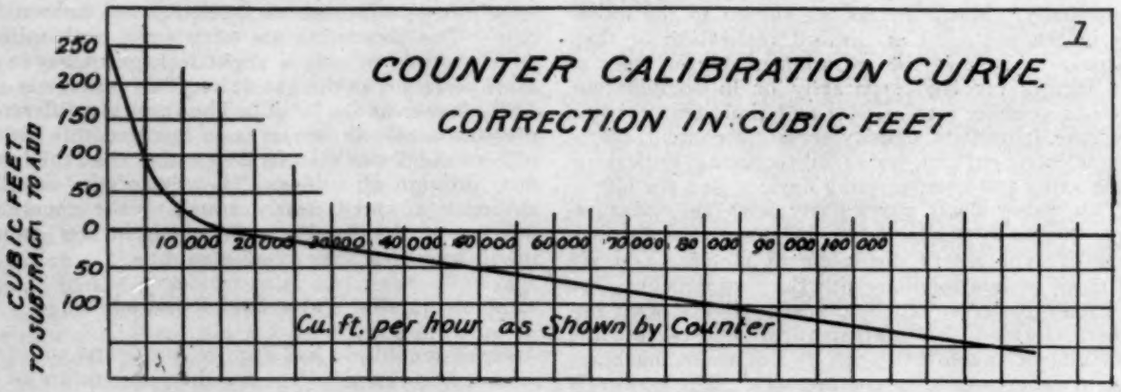


Fig. 1. Counter calibration curve on meter with rating of 62,000 cu. ft. per hr.

that at the rate of 2,000 cu. ft. per hour 200 cu. ft. must be added to the counter reading to compensate for the variations in slip at this rate of flow. At this rate of flow the variation in slip from the average slip geared into the counter is relatively large. The ordinary practice is to recommend a single meter to be accurate from its maximum capacity down to 10 per cent of its normal rate of capacity. This meter, at 10 per cent of its normal rating of 6,200 cu. ft. per hour, has, as shown by the curve, a variation of 1.05 per cent from the average slip geared into the counter.

Tandem Meter

Fig. (2). A so-called "tandem meter" has been developed and is illustrated. This meter is accurate within 2 per cent of all rates of flow up to its maximum capacity without requiring the making of corrections or the use of the correction curve. This meter employs in combination a rotary displacement meter element, and a diaphragm meter element, with a common counter. The diaphragm meter records all the gas at the low rates of flow up to the capacity of this meter. The gas which passes through the diaphragm meter also passes through the rotary dis-

placement meter. After the full rated capacity of the diaphragm meter is attained, the diaphragm meter then is automatically cut out of service, all of the gas now passes directly through the rotary displacement meter. The counter is moved by the meter which operates at the greater rate of flow. Throughout the range of the diaphragm meter the diaphragm meter will operate the counter faster than would the rotary displacement meter as some of the gas slips through the rotary displacement meter at this relatively low rate of flow without producing rotation. Just before the diaphragm meter reaches its rated capacity, the higher differential will make it lag behind the rotary displacement meter, the result being that the rotary displacement meter then operates the counter faster than the diaphragm meter.

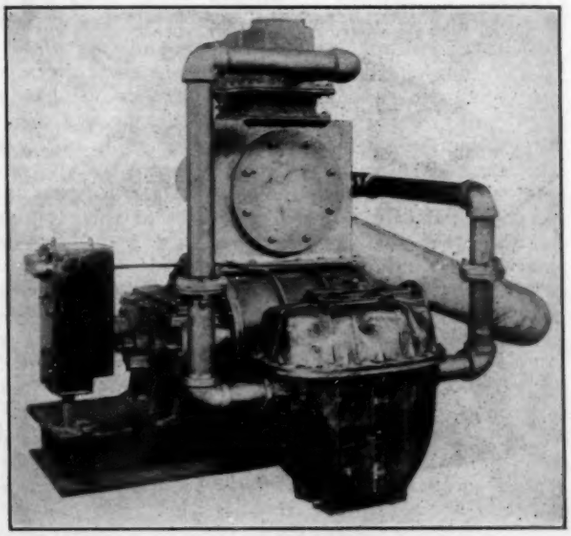


Fig. 2. Tandem Meter

Fig. (3) shows a counter calibration curve of a meter including a diaphragm meter element and a rotary displacement meter element. The shaded portion at the left of the counter calibration curve shows the range through which the diaphragm meter element dominates the counter movement. The remainder of this curve shows the range through which the rotary displacement element dominates and operates the counter. This curve also shows the accuracy of this arrangement of meter by expressing the counter calibration in per cent of the rate of flow. Based upon the diaphragm meter being accurate within plus or minus 2 per cent. Throughout its normal rating, this portion of the curve shows a maximum error throughout the entire range of the tandem meter. The percentages of error from the rate of 14,000 cu. ft. per hour up to 100,000 cu. ft. per hour, are, as shown by Fig. (3), so small as to be negligible, and are considerably less than 2 per cent as allowed diaphragm meters.

Errors Small

The gas fraternity has long been familiar with the accuracy of both diaphragm meters and rotary displacement meters, as well as the use of rotary displacement meters as demand meters. The counter calibration curve when put in the form of per cent correction instead of cu. ft. correction, and as shown by that portion of the curve to the right of the shaded portion at the bottom of Fig. (3), demonstrates the small error resulting from making no corrections for variation in slip at the different rates of flow, and is typical of the results obtained by operators of the rotary displacement meter.

At the present time the only meter that will be approved by the state is the diaphragm meter. For

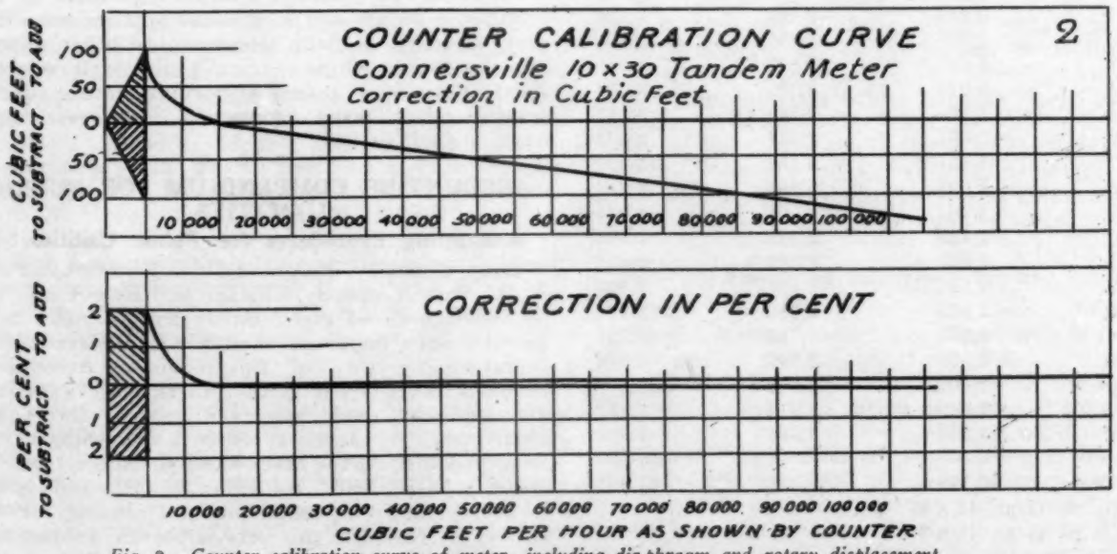


Fig. 3. Counter calibration curve of meter—including diaphragm and rotary displacement meter element.

measuring large volumes of gas these meters are bulky and a large number are required for very large hourly rates. This very often results in dissatisfaction on the part of the consumer, who does not want to provide the necessary room.

Many rotary displacement meters have been used because first cost is small, but little space is required, cost of operation and maintenance are negligible, and they are accurate to a degree that is well within the legal requirements.

In my estimation the rotary displacement meter offers the most satisfactory method of measuring large volumes of gas on the consumer's premises. The manufacturers have developed these meters. We need these meters. Is it not the duty of the gas men of New York State, through this organization, to see that these meters are properly presented to the state for approval?

Typical Monthly Registration of Meters

Three Connersville high pressure rotary displacement meters in service.

No. 65 and No. 66 immediately beyond compressor.

Woowlawn meter, 14 miles from compressor.

Daily measurements corrected to standard condition.

Date, February	No. 65, M Cu. Ft.	No. 66, M Cu. Ft.	Woodlawn, M Cu. Ft.
1	2,224	2,202	2,179
2	2,973	2,932	2,908
3	2,844	2,842	2,818
4	3,430	3,450	3,410
5	3,295	3,289	3,201
6	2,596	2,605	2,590
7	3,457	3,461	3,423
8	2,674	2,661	2,659
9	3,107	3,772	3,023
10	2,951	2,955	2,950
11	3,258	3,260	3,196
12	2,998	3,034	2,975
13	2,647	2,667	2,689
14	3,078	3,075	3,018
15	3,164	3,151	3,117
16	3,031	3,011	3,003
17	3,131	3,121	3,007
18	2,994	2,995	2,945
19	3,085	3,063	3,045
20	2,929	2,920	2,863
21	2,839	2,862	2,836
22	2,582	2,555	2,713
23	2,975	2,980	2,936
24	2,762	2,786	2,736
25	2,892	2,949	2,864
26	2,601	2,562	2,565
27	2,929	2,914	2,871
28	3,352	3,354	3,320
Total ...	82,798	82,732	81,931

No. 65 is an 18 x 27.
No. 66 is an 18 x 27.
Woodlawn is an 18 x 36.

Book Reviews

NEARLY ALL THERE IS WORTH KNOWING ABOUT MANUFACTURED GAS

Manufactured Gas: a Textbook of American Practice. By Jerome J. Morgan, M.S., Ph.D.; published by the author, Broadway at 119th Street, New York City; 518 pp., 241 illustrations and diagrams.—To say that one could include within the covers of one volume of considerably less than encyclopaedic proportions nearly all there is worth knowing about the production of manufactured gas is to make a statement of a rather broad nature. But in our opinion this is just about what Dr. Morgan has accomplished. Having read portions of this volume and thumbed over its pages—with a great deal of pleasure and enlightenment be it said—for the past two months we might aver that this effort to compile within the covers of one book so much worthwhile gas lore is nothing less than monumental in its scope. A splendid contribution to gas literature. A well written volume that no forward looking gas man can afford to be without. We predict that it will fill the role of a text book in our various colleges that concentrate to any degree on the study of gas. Messrs. Alfred E. Forstall, C. E. Paige, F. C. Weber, and W. S. Yard assisted Dr. Morgan by way of much timely advice and suggestion.

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PLANNING AND EQUIPPING THE SHOWROOM

The Modern Gas Showroom. By "a business architect." Walter King Ltd., London, England; 62 pp., 23 illustrations.—This volume sets forth in a very practical and understandable way some very good suggestions and ideas for attracting customers into the gas company showroom. It comprehensively deals with the necessity for attractive showrooms and windows and goes on to describe such important items as selection of the site, architectural features of the building, interior decoration of the showroom proper and location of appliances on display, selection of floor salesmen and other miscellaneous items. Quite naturally the well selected illustrations form a very important feature of this treatise which many commercial managers should have on their desks.

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ACCOUNTING COMPENDIUM FOR PUBLIC UTILITIES

Accounting Procedures for Public Utilities. By Warren G. Bailey, M.A. and D. E. Knowles, C.P.A.; A. W. Shaw Company, Chicago and New York; 471 pp., 36 figures.—Messrs. Bailey and Knowles have added a very important contribution to accounting literature by way of this volume. Accounting methods taken from actual practice are explained and discussed and, wherever needed, forms are illustrated. The authors' work is refreshingly free from padding; on the other hand, the subject matter is not a "hand book" collection of facts and data—it will certainly be found pleasant reading for the person interested in this very important subject and one that will add materially to his fund of knowledge.

Twenty-Third Annual Meeting of Illinois Gas Men Held in Springfield

Neil C. Albin

THE seventh annual joint convention of the three utility associations, the Illinois Gas Association, the Illinois State Electric Association and the Illinois Electric Railways Association, was held in Springfield, March 17 and 18. This was the twenty-third annual meeting of the Illinois Gas Association, the twenty-sixth annual meeting of the Illinois State Electric Association and the eighteenth annual meeting of the Illinois Electric Railways Association.

The decision to return to Springfield for this year's joint convention was prompted principally by the success of the 1926 convention which drew an exceptionally large attendance. The attendance this year will surpass any previous year on record, perhaps more than a thousand men and women from all portions of the State registered.

Morning Meetings Held Jointly

Following the procedure of former years the meetings held in the morning of each day were given over to a joint session of the three associations. The Thursday morning joint session was opened at the Abraham Lincoln Hotel by a talk from John H. Mitchell, president of the Illinois State Electric Association; who was followed by S. L. McElhoes, attorney of Oklahoma City, who told of the benefits derived from the Terminable Permit Law in Oklahoma.

The workings of this law were explained in detail to the assembled delegates and as this is an important topic in the State of Illinois today the assemblage now has a much clearer understanding of such a law.

The next speaker of the Thursday morning session was Mr. G. C. Neff of Madison, Wisconsin, vice-president of the Wisconsin Power & Light Company, who talked on the subject of "Rural Electrification." The morning joint program closed with a general discussion of modern transportation by Mr. W. H. Sawyer, president of the American Electric Railway Association.

Public Utility Information Section

The Friday morning joint session was taken up entirely by the Illinois Committee on Public Utility Information, and was presided over by Bernard J. Mullaney, who is the director of the Illinois Committee. Various prominent men in the industry discussed the meaning of the work of the Illinois Committee on Public Utility Information. Mr. Herbert B. Dorau, research assistant at North Western University, and Dr. H. M. Gray of the University of Illinois addressed the joint session on pertinent topics pertaining to the utility industry as a whole.

The entertainment features of the convention consisted of a banquet Thursday evening given by the Springfield Engineers Club, who invited as their guests all delegates attending the joint convention. Mr. David H. Jackson, chairman of the Illinois Commerce Commission and J. Paul Kuhn, commissioner of the Illinois Commerce Commission, were the principal speakers of the evening. Friday at noon a luncheon was held at the Leland Hotel for the ladies of the convention. Friday evening the delegates were entertained at a theatre party at the Majestic Theatre.

One of the outstanding features of the convention was the enormous display of exhibits which consisted of charts, diagrams, maps, mechanical models, motion picture films, stereoptical slides, etc.

Papers on Important Topics

The gas session convened on Thursday and Friday afternoons at the Leland Hotel and was presided over by Mr. W. A. Bertke, president of the Illinois Gas Association. The papers presented at these two sessions were topics that are of great importance to the gas industry. It is certain to assume that concentrated effort will still be in effect toward a greater development of the industrial and house heating loads. However, it must be borne in mind by the gas man that he should not lose sight of the fact that

the load curve can be considerably straightened if enough attention is given towards the development of properly designed rates.

At the Thursday afternoon session papers were presented by Mr. A. J. Luick, consulting engineer of Chicago, on "Load Building Domestic Gas Rates." He said in part that the choosing of different rates such as the three-part rate, the quick break rate, etc., can be adopted in strengthening the load curve of any company in building up domestic gas consumption. He suggested that the adoption of such rates should be governed entirely by the local conditions and that the acceptance of the proper forms of rates to meet these local conditions would be just a matter of time. Mr. T. V. Parcell of the Peoples Gas Light and Coke Company, and Mr. A. C. Hall of the Illinois Power and Light Company, discussed this paper and further agreed that existing rate schedules serve a large per cent of customers below cost, and that the rate adopted in building up gas consumption should coincide with the cost curve. In choosing a rate to bring about this increased consumption a great deal of thought must be given to the effect it will have upon the net earnings.

Gas Service

"Gas Service and What It Is Not" by J. Howard Mathews, assistant chief engineer of the Illinois Commerce Commission discussed the conditions of gas service in the State of Illinois. His opinions were based upon the system of grading that the Illinois Commerce Commission uses in grading service for all utilities. His paper contained the idea that it is perhaps better for the gas man to spend less time in advertising his company and public relations work and devote more energy towards the bettering of service. The discussions that followed this paper and the comments made upon it by different prominent men in the state were very favorable and was accepted with the attitude that it is perhaps best to practice what you preach.

Major Alexander Forward, managing director of the American Gas Association, was in attendance at this session and made an impromptu talk in which he told of the assistance that the National Association was giving towards the many problems confronting the gas industry today. He commented on Mr. A. J. Luick's paper, saying that gas consumption could be developed to unlimited extent if the rates were so designed to meet existing conditions. He suggested that a great deal of work should be done along this line in order to compete with the electrical industry who have developed their business by the means of properly designed rate.

Mr. W. R. Lacey of Milwaukee, Wisconsin, closed the Thursday afternoon session with a paper on "Merchandising Gas Appliances."

Various Timely Papers

At the Friday afternoon session papers were presented by Mr. G. C. Carnahan, The Peoples Gas Light and Coke Company, Chicago, on "Factors and Influences and Promote the Sales of Gas for Heating." Mr. A. C. Fieldner, U. S. Bureau of Mines, Pittsburgh, Pennsylvania, gave a very important paper on the "Recent Developments in Carbonizing and Processing Coal in Relation to the Gas Industry." Mr. W. F. Miller, industrial gas engineer, Public Service Company of Northern Illinois, closed the convention with a paper on "Industrial Gas Sales." The papers at this last session were very well received and the discussions that followed brought out important points that should be considered in the future development of the industry.

The new officers of the ensuing year of the Illinois Gas Association are as follows:

President, Paul D. Warren, The Peoples Gas, Light & Coke Co., Chicago, Illinois.

Vice-president, J. A. Strawn, Central Illinois Light Co., Peoria, Illinois.

Secretary-Treasurer, R. V. Prather, 205 Illinois Mine Workers Bldg., Springfield, Illinois.

Board of Directors, B. J. Mullaney, The Peoples Gas Light & Coke Company, Chicago, Illinois; H. S. Whipple, Rockford Gas Light & Coke Company, Rockford, Illinois; R. E. Chew, Union Gas and Electric Company, Bloomington, Illinois; R. B. MacDonald, Peoples Power Company, Moline, Illinois; R. S. Wallace, Central Illinois Light Company, Peoria, Illinois; Chas. W. Bradley, Public Service Co. of Northern Illinois, Chicago, Illinois; J. E. Johnson, Illinois Power & Light Corporation, Chicago, Illinois; E. E. Lundgren, Western United Gas & Electric Co., Aurora, Illinois; Harry Channon, Central Illinois Public Service Co., Quincy, Illinois.

The committee on arrangements for the convention and Mr. R. V. Prather, secretary for the three associations should be congratulated upon the program, entertainments and other features. It can be said that the 1927 joint convention was probably one of the more important meetings that has occurred in recent years. From all reports the year 1927 should be another year of substantial progress and activity in the industry.

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ASSOCIATION HIRES INDUSTRIAL GAS WRITER

J. B. Nealey, formerly connected with the Surface Combustion Company, New York, N. Y., has been hired by the Association to prepare articles for the trade publications and secure additional publicity on the various applications of gas in industry.

Mr. Nealey's work will be the amplification of the work formerly done by the Publicity Committee of the Industrial Gas Section, of which H. O. Andrew, New York, N. Y., is chairman.

Market Remains Very Steady

Business spending its time to improve methods and organization

Walter Alwyn-Schmidt

THE first quarter of the year now completed has brought few changes from the last quarter of the previous year. Business has been comparatively good, but there has been little incentive to expansion. Businessmen, on the contrary, have been inclined to follow a most conservative course, waiting for the market to declare itself in one or the other direction. A situation such as the present does not leave much room for special exertions. The market does not react easily upon ordinary means of stimulation, and competitive activity will merely help to shift the profits of business from one shoulder to another, without, however, increasing the volume of turnover.

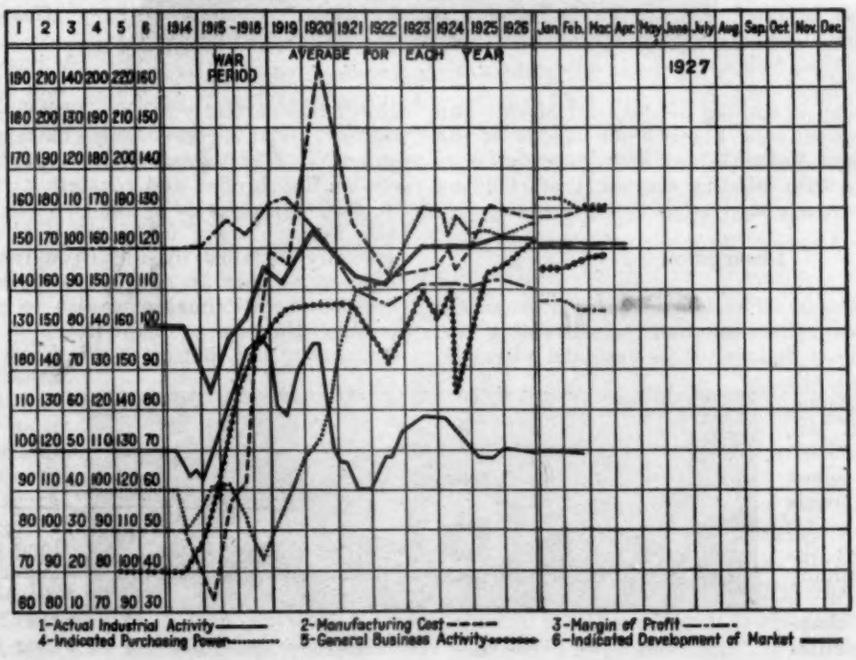
Business Volume Above Normal

The student of market and business phenomena, therefore, finds little to interest him in the present condition of the market. An exception possibly might be an enquiry into the causes of the extraordinary steadiness of the market upon comparatively so high a level of activity. Because whatever may be said about the present situation there is no denying that one fact: the volume of business has remained above normal.

Human nature as expressed in its business activities apparently is not made to enjoy a continuous run of one and the same weather. Business men are humans and as humans they crave change. They know that stability, when carried to excess, may ultimately lead to inertia, and it is inertia which is most of all detested by the American man of affairs. Change means action, action increases enterprise. It does not matter whether the market shows a downward or an upward trend as long as it keeps in motion.

How, then, is business spending its time just now, so as to be prepared for whatever the future may hold in store? Mention has been made already in earlier reports of the geographical displacement of industrial activity now in progress. The re-alignment now finds its counterpart in the technical handling of commerce. The tendency seems to be to simplify the conditions under which the nation's business is carried on, in order to fit it better for its new problems. A very excellent example of this process is the commercial re-building of the New York market which has taken place during the last few years, and which is duplicated in other large

(Continued on page 349)



Half Moon Hotel

Gas to be used extensively in kitchen

ALL the superlatives that might be used to describe the opening of the season of 1927 at Coney Island seem to cluster naturally around the new hotel—it is the biggest, brightest, most wonderful thriller of them all. The officers of the company—William J. Ward, president; Joseph J. Sartori, vice-president; William C. Meinch, treasurer; Mary E. Dillon, secretary; and Stephen F. Barrera, assistant secretary; are all prominent Coney Island business people. The architects, George B. Post & Sons, the general contractors, Cauldwell-Wingate Company and the operators, American Hotels Corporation, are sufficient to guarantee the standards of the enterprise and its operation.

In fact the name itself, Half Moon, is not without any illustrious history. The Half Moon bearing Henry Hudson, an English explorer in the employ of the East India Company of the Amsterdam Chamber, sailed into Gravesend Bay on September 9, 1609, and lay to for more than a week, during which time a landing was made on Coney Island. This is a well authenticated fact accurately recorded in the log of the Half Moon—and so today this great new hotel which stands at the gateway of New York Harbor appropriately bears the name of the little ship that carried Henry Hudson safely to the new world.

Coney Island's New Hotel

Description

The Half Moon is a fourteen-story, fireproof, modern hotel with three hundred rooms, costing two and a half million dollars. It is designed after the style of the Spanish Renaissance, built of soft tan, grey and pink brick in a range of seven shades. The roofs are covered with Spanish mission tile, the whole building terminating in a tower with a dome of blue and yellow terra cotta topped with a weather vane, a bronze silhouette of the Half Moon with full sails set, mounted on an armillary sphere, a reproduction of an astronomical instrument used for noting the apparent position of heavenly bodies in making a reckoning of a ship's course by mariners of Hudson's time.

At night this tower will be flood lighted—a great beacon that can be seen twenty-five miles out to sea. This building occupies one of the most conspicuous positions on the Atlantic coast and passengers on incoming vessels see it as the first of New York's skyline.

The kitchen is located between the ballroom and the main dining room. The equipment is of the most modern type. It seems more like a great laboratory than a kitchen. Wide windows ventilate it and provide light, and added ventilation is given by great ducts opened in the ceiling. Every bit of apparatus is arranged with a view of utilizing space and furnishing the most direct routing for the assembling of a meal.

One of the Murals in the Grill—By Griffith Bailey Cole

Gas Equipment

A huge cold storage system is one of the details of this perfectly equipped kitchen. The cooking will be done at a great hooded battery of gas ranges—nine No. 3751 Vulcan hot top ranges, four No. 756 combination broiler and roasters, two griddles, two No. 3030 Vulcan griddles and two Blodgett No. 222-G bake ovens. A six inch cast iron main has been especially installed by the Brooklyn Borough Gas Company so that an adequate supply of gas can be furnished at all times, and also to provide for the possible enlargement of the hotel.

It is expected that after this hotel is in operation others will be built and that a new hotel zone will be created. Coney Island will then become another great resort city inviting the visitor for long periods of stay, instead of furnishing amusement only for the day. It fills a long-felt want.

As The Journal Views It

VALUABLE DATA

Refrigeration for the home through the medium of using gas as the fundamental power agency looms increasingly prominent. Indeed, we are but marking time preparatory to the widespread selling of this device which constitutes the latest application of gas for further modernizing the home.

It is therefore obvious that those employees in our industry who will be most concerned with the process of selling gas fired refrigerators should sufficiently understand the mechanical operation of these units. Particularly is this so of the merchandising department's salesmen and those employees who will service the refrigerators. Moreover these men should be somewhat familiar with the operation of the competitive units—refrigerators employing electricity for their operation.

Some commercial managers will no doubt argue to the effect that it will not be necessary for the salesmen, at least, to understand the elementary working principles of this appliance. Others—constituting a large majority, we believe—will eagerly welcome any such acquisition of knowledge that the salesman can easily and readily find available.

It is felt that the latter men and their salesmen will derive a large measure of both interesting and usable information by way of reading Mr. Heyman's article on the subject of refrigeration which appears elsewhere in this issue. There is a vast fund of valuable data and information in the same which has been worked out in a quite understandable manner. One does not necessarily have to be a technical man in order to easily digest the subject matter of this article. As a matter of fact its strength as a well written summary of the elements of refrigeration commends its earnest perusal of gas merchandising salesmen.

It should form, in a sense, an elementary text book for the men who will be most instrumental in putting this latest gas appliance into thousands of homes in the near future.

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FILLING IN THE VALLEYS

To the uninformed a weekly load curve of virtually every gas company extant doubtless represents a contour map of Switzerland or some other markedly mountainous country. To the gas man such a graph constitutes, in a mental sense at least, an instrument of torture.

There is ever an unceasing effort on the part of the forward looking executive and operating men to smooth out such load curves until they begin, at least, to approximate the much desired contour of a plateau. The prime motive for such striving after this flattening out, works toward two happy ends; first, a minimum plant investment for a given output and second, the ultimate lowering of rates for certain classes of customers.

From the standpoint of domestic users of gas the cooking load forms the largest item of gas sendout. And there will not be any great increase in this direction except as the population increases. More it is not very likely that the cooking load will be strung out to the crazy-quilt end that half of a gas company's customers will cook the meals at one time and half at a later interval. Hence we can look for no valley filling tendency in this direction.

There are however three gas consuming appliances that furnish a goodly amount of comfort to those most concerned with flattening out the load curve. Named in the eventual order of their value and importance they are the water heater, incinerator and gas fired refrigerator.

The water heater is brought into use in the home at a time after the cooking process is completed. Thus we see gas used for heating water for dish washing and for the bath; generally in the evening or early morning. We are prone to delude ourselves with the idea that we are "going great guns" as far as water heating is concerned. Subject to correction we do not believe so. We need a more vigorous sales policy along the line of marketing automatic storage systems. Here we run up against the matter of price which—so some gas men are wont to allege—makes it difficult to market such an appliance to many housewives whose pocketbooks are ever in a vacuous condition. If this is so manufacturers should endeavor to bring out a cheaper model or "flivver," if possible.

Incinerators and gas fired refrigerators complete the trio whose intelligent study and intensive marketing will help greatly in filling out the valleys of our load curves.

INDUSTRIAL GAS LESSONS

IF IT'S DONE WITH HEAT — YOU CAN DO IT BETTER WITH GAS

Lesson No. 163

Oil Gas

Further Details of the Dayton Process

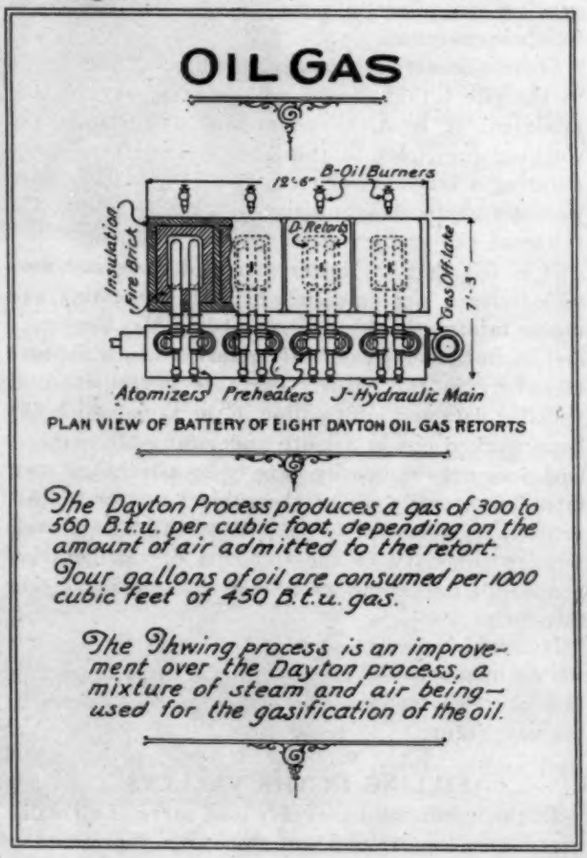
The Dayton generator is started by first burning enough oil in the combustion chamber to bring the temperature of the generating retort up to the proper point. When this has been done, the amount of heating oil fed into the combustion chamber is greatly reduced and a mixture of oil and air is introduced through the atomizer. The air previously passes through the preheater which raises its temperature materially and in mixing with the oil causes its partial combustion, while at the same time the rest of the oil is decomposed to form gas. It is possible to produce a gas of 300 to 560 B.t.u. per cubic foot in this retort with but little heating oil consumption, but when gas of higher thermal value than 560 B.t.u. is desired it is necessary to use a considerable amount of heating oil. The reason for this is that the amount of air that is admitted under these conditions is limited for the express purpose of conserving the oil in the retort, that is reducing its combustion as far as possible, so that the oil is rather converted into combustible gases of high calorific power. Hence more fuel oil must be burned in the combustion chamber to bring the temperature of the retort up to the right point.

Four gallons of oil are consumed for the production of one thousand cubic feet of 450 B.t.u. gas. A small amount of tar, about 0.3 gallon per thousand cubic feet, is recovered. Carbon forms in the retort if it is not properly operated.

The Thwing Process

Before leaving this subject of oil gas, mention must be made of one other process and that is the Thwing process, which is said to be a modification of the Dayton process, being an improvement of the latter. The process is said to use a mixture of oxygen and steam for the gasification of oil.

In leaving this subject of oil gas it is necessary to call attention to the fact that while this process is limited in its application at the present time to those localities where oil is cheap and abundant and where coal is scarce and expensive, nevertheless there is a possibility of more extensive application of the process in the average gas works as a peak load process. This may be the real function of the oil gas process in the future. It is common knowledge that the peak load has given the gas engineer considerable trouble and always worries him and the gas company. The peak load fear has done much to delay the development of gas, for it is a load which is expensive and hard to take care of. It requires an elastic equipment in the gas works, one that can be thrown into constant operation when the need comes and one that is not used at all by far the greater portion of time during the year. Many reasons have been advanced to show that the oil gas process possesses certain important intrinsic advantages which its use as a peak load process makes both feasible and economically and technically advantageous.


OIL GAS
12'-6"
8-Oil Burners
Insulation
Fire Brick
D-Retorts
Gas Off-take
7'-3"
Atomizers
Preheaters
J-Hydraulic Main
PLAN VIEW OF BATTERY OF EIGHT DAYTON OIL GAS RETORTS
The Dayton Process produces a gas of 300 to 560 B.t.u. per cubic foot, depending on the amount of air admitted to the retort.
Four gallons of oil are consumed per 1000 cubic feet of 450 B.t.u. gas.
The Thwing process is an improvement over the Dayton process, a mixture of steam and air being used for the gasification of the oil.

HOW ABOUT TOP COOKING

We wonder if the gas man is giving enough thought to top cooking?

Has the home service department been instructed to dig up and offer the home manager more and better ways to cook food on the main top of the gas range—has any one heard of new uses for the double

boiler, more foods that may be cooked by slowly boiling in the double boiler on the top of the gas range. It seems to us that here is another item to add to those listed to maintain and build up the domestic load.

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REASONS WHY

Every day of the week we receive telephone and personal calls from housewives asking us why this or that happens. "My cake rose beautifully and when I took it out of the oven it fell. Why?" Perhaps the following "reasons why" will help you to avoid imperfect products:

Cakes crack on top because too much flour has been used in the mixture. Long experience is supposed to teach us the consistency of a cake batter. Sometimes, in making up a new recipe, the amount of flour seems too little, and more is added without noticing that there is chocolate or cocoa, or there are more eggs in it than the recipe with which you are familiar.

Another reason why cakes crack on top is incorrect temperature. If the oven is too hot the cake browns on top before it has risen sufficiently, and in its attempt to rise breaks through the crust, making an unsightly loaf.

If cake is put into a too slow oven it often rises over the sides of the pan and is of very coarse texture.

There are many reasons a cake is soggy. It may be too much sugar, or it may be due to insufficient baking. A cake seems done when you can hear it "sizzling" and it springs back into place when pressed lightly with the finger tip, but when removed from the oven it sometimes settles down and becomes soggy. This is particularly likely to happen to sponge or angel cakes, and is because the cake has not cooked sufficiently.

Cake that is very crumbly has too much shortening. Sour milk cakes are often this way; the remedy is to use a little less shortening.

If pound cake has a coarse texture it is because it has been made with granulated sugar. Powdered or confectioner's sugar makes a fine grained product.

Angel cakes should not be baked in loaves. The angel cake tin is made with a cylinder in the middle for the express purpose of holding up the center of the cake.

Too hot an oven, and uneven spreading in the pans, will cause a loaf of cake to rise unevenly. Providence Home Service Bulletin.

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COOKING DEMONSTRATIONS

The more we hear about the success the home service departments of various gas companies are having the more we feel like shouting. It takes a long time for some gas men to appreciate the value of this department. Selling the idea as some of these

home service workers are doing will do more than any other one thing to build up and maintain the very essential domestic load—if every gas company in the country would get squarely back of this movement to "Show the Home Manager How" and not try to trace results from each dollar spent in such work what a wonderful increase in the per meter consumption we would have—and too, think of the many appliances we would sell. If you are contemplating starting a home service department—by all means get a trained domestic science operator—do not just get some one who comes well recommended and who will work cheap.

Brooklyn 36th Annual Food Show

Gas accepts a rightful place in food preparation

Joseph W. Piatt

" . . . All human history attests·
That happiness for man—the hungry sinner!
Since Eve ate apples, much depends on dinner."
BYRON

THRONGED by visitors almost at the instant of opening, the 36th Annual Food Show of Brooklyn closed March 19 after a two week's success that crowded the 13th Regiment Armory to capacity during all its open hours.

The Food Show exemplified the versatility, convenience and magnificence of modern life. One might

Brooklyn Union Booth

almost say the spirit of the Food Show was convenience, cleanliness and purity in products.

Much that could aid the housewife in the realization of this up-to-date sense of food production was at hand to give her the means of handling food preparation in her own kitchen, as well as devices for reducing the chores of house work to the minimum.

Chief of the displays of household utilities was that of The Brooklyn Union Gas Company. Fuel and appliances for using it in cooking food are essentially part of a food show, because of the necessity of heat in food preparation.

Brooklyn Union Gas Co. Has Beautiful Booth

In a beautiful centrally located pavilion, decorated in the lighter mood of Springtime, gas fuel was shown in its application to the uses of the home. Here in a large booth divided into eight sections radiating outward from a central dome topped structure, the visitor found the last word in gas stove and domestic gas appliance design.

Parlor and living room comfort was impressed upon the observer by a radiantfire gas heater of ornamental design set in a tiled mantelpiece in the reception booth, which was furnished and decorated in the style of a professional man's waiting room.

Another booth was devoted to home service cooking demonstrations. Here The Brooklyn Union Gas Company dietitians and professionally trained cooking experts held the attention of the passing multitudes, while living demonstrations were given showing the value of gas fuel in cooking, and the ease of its operation in oven work by means of the heat control system now installed upon all high class gas ranges. The young women of this efficient service organization handed out samples of pastry, bread, rolls and other dainty foods which were cooked in view of the spectators. They gave brief instructive talks on methods of preparing food and the use of the range in cooking. Questions were answered and pamphlets containing cooking recipes for home use were distributed to a constantly changing but highly appreciative audience.

The value of the home service division's work in the Food Show is growing, and it impressed one as of greater potential value than all the other features of the gas company's exhibit combined—in fact this one section contained the living, vital spirit of the home in relation to fuel, food and its preparation as a part of a food show.

TRAINING THE GIRL SCOUT IN HOME SERVICE AT ROCHESTER

To prepare for their Homemaker's, Electrician's and Cook Merit Badge tests in a model home laboratory with every modern gas and electric convenience is the fortunate experience of Girl Scouts in Rochester, N. Y., who study modern methods of cooking and home planning under the direction of the Home Service Department of the Rochester Gas & Electric Corporation. The only requirement for admission to the classes is the advance registration which limits the number in each section thereby allowing each Scout a certain amount of personal attention from the supervisor.

Wherever the nature of the work requires direct supervision the classes are limited to a small number. The Cook Merit Badge Course which can be completed in two lessons is limited to five members. These classes meet on Saturday mornings at 9:30 o'clock in the Home Service Home. In this course the Scouts first learn how to plan a well-balanced menu. The meal must come within the budget of an

average income and above all it must meet all of the requirements for nutrition. It must also be attractively served so that it will appeal to one aesthetically. And so the Girl Scout learns how to design attractive dishes—how to place a bit of parsley alongside the meat loaf or how to arrange the colorful pimiento on the slice of pineapple. These are only a few of the interesting features in the Home Service Course given for the Girl Scouts.

Scouts Go Marketing

Then the Scouts go marketing, studying the prices and making imaginary purchases. However they do select the various parts of the menu which they will make up in the second class. When the next Saturday rolls around the same group of Girl Scouts will come into the Home Service Kitchen to find their purchases all on hand, ready to be prepared and cooked in the oven-regulated gas range.

Potatoes are peeled, muffins are stirred up in a jiffy, the table is smartly set and everything is going hummingly in the oven. Now it is time to invite a special guest for the dinner which is about to be served. One of the number is selected to act as hostess and another becomes the maid. The guest accepts, the food is ready so the five Scouts and their guest sit down to enjoy a well earned repast and the right to take their test for the coveted merit badge. On every third Saturday the Tenderfoot Scouts come in for their Second Class cooking lesson. Each Scout brings the egg which is to be poached and served on a nut brown slice of toast. Each one lights the burners, toasts the slice of bread in the electric toaster and practices table service.

In this way Rochester Girl Scouts are learning how to assist their mothers in household management. They are building a sturdy set of home interests which will enable them to meet life graciously and earnestly.

Westchester Lighting Company's Home Service Department Takes Active Part in Exposition at Port Chester

Edath Yeager

THE home service division of Westchester Lighting Company contributed many features of unusual interest to the Merchants', Manufacturers' and Home Owners' Exposition which opened March 12 at Recreation Hall, Port Chester, and continued throughout the week until Saturday, March 19.

Each day the different home service directors of the company gave demonstrations which held a particular interest for the housewife, in their attractive booth at the exposition fitted comfortably to appear as a room in a home. The range of subjects covered was very broad indeed—it included, simplified ways of making unusual desserts, table decorations, favor making, modern home lighting, interior decoration as well as a practical demonstration of modern electrical and gas appliances. The program for each day was as follows:

On Monday afternoon, March 14, Miss Margaret Hutton, B. S., domestic science director of the Lighting Company, gave a practical demonstration of the making of various cakes needing "just a bit of care" to bake successfully in the ordinary oven, that with oven heat control, guess work is entirely eliminated from the baking of sponge cakes, angel cakes, and other delicate foods.

Westchester Lighting Company's Booth

Baked Alaska Delights Audience

Miss Hutton baked "Baked Alaska" in an oven heat control to the great delight of her audience. She served samples of the baked ice cream.

On Tuesday afternoon, March 15, Mrs. Sarai Waugh, lighting specialist of the company gave a talk on "Color," and explained how the personality of the individual may be expressed by the wearing of certain colors. She also demonstrated how the home could be beautified by means of colored lights.

On Wednesday afternoon, March 16, Mrs. Frances B. Germain, supervisor of window displays for the company answered all questions on table decoration. She also gave demonstrations on favor making. Mrs. Germain's table decorated for a St. Patrick's party claimed the attention of every woman who hoped to do a little something "different" for her guests.

On Thursday afternoon, March 17, Mrs. May Skelling, local home service director at Port Chester, answered all questions on the electrical and modern gas appliances.

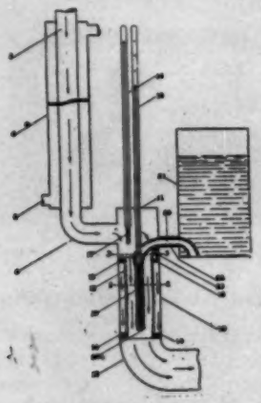
The same afternoon Mrs. Cecil G. Harvey, director-in-charge of the home service division talked on the benefits of home service and what it offers to the busy housewife. She also spoke of its advantages as an educational aid to the children of the county.

On Friday afternoon, March 18, Mrs. Ada B. Vail, assistant in the Bureau of Fisheries, Washington, D. C., and a representative of the Middle Atlantic Fisheries Association, through the courtesy of the company gave a lecture demonstration on fish. Mrs. Vail especially stressed in her demonstration the various kinds of fish adapted to the Lenten season.

PROGRESS IN GAS TECHNOLOGY
Domestic and Foreign

REGULATING WATER GAS MACHINE

THE illustration shows a means of ascertaining, increasing and maintaining the efficiency of water gas machines. This method depends on the determination of the percentage by volume of the undecomposed steam in gases which emerge from a water gas generator. The method consists in bringing the gas to a predetermined constant temperature above the dewpoint and then reading a wet bulb thermometer, shown at 16 and 18, which is inserted



in the flow of the gases. This thermometer is calibrated so as to read the moisture content directly in percentage by volume. In the figure the gases from the generator are passed through the cooler, 6, and enter the pipe, 10, wherein the wet bulb thermometer is located. The wick surrounding the wet bulb of the thermometer is fed with water from the water tank, 21, through the tube, 20. United States Patent No. 1,620,864.

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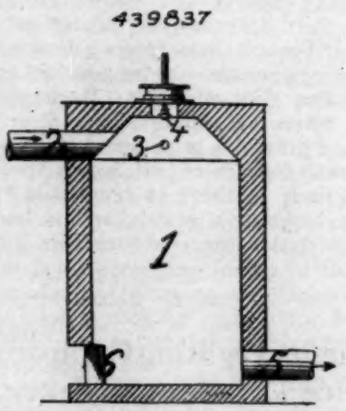
THERMAL REQUIREMENTS OF THE CARBONIZATION PROCESS

COKING heat is the quantity of heat expressed in calories which is used to convert one kilogram of dry coal at a temperature of 20 degrees C into coke at any given temperature, calculated on coke, liquor and liquid tar at 20 degrees C and including the energy in calories in the gaseous products of carbonization. The normal value of coking heat is that obtained at 1000 degrees C. A special form of apparatus was used for determining the coking heat of various gas and coking coals.

CARBURETING WATER GAS WITH ATOMIZED OIL

WATER GAS is carburetted by means of atomized oil in the apparatus which is shown in the accompanying illustration according to a process patented in German Patent No. 439,837. The chamber, 1, is lined internally with fire-brick. The chamber is either heated from the outside or internally, before the oil that is used to effect the carburation is introduced. Thus, for example, gas is introduced through the opening, 2, and air is admitted at 3 into the chamber and the gas is burned within the latter. The oil is then admitted through the nozzles, 4, it being sprayed in under a certain definite and sufficient pressure, so that it is mechanically atomized, whereat its gasification or vaporizaiton is effected by the radiating heat from the walls of the chamber.



The nozzle, 4, is arranged in such a manner and its dimensions are so chosen that the sprayed-in oil does not reach either the walls of the chamber or the bottom of the carburettor. Inasmuch as the drops of oil do not come into contact with the hot walls of the chamber, 1, or at least only to a very limited extent, it follows that these walls must remain clean and active. The water gas which is to be carburetted is admitted into the chamber through the opening, 2, in the direction of the arrow, is intimately mixed with the oil vapors which are floating around in the chamber and then leaves the chamber through the opening, 5. The solid residues which are formed from the oil during this process collect at the bottom of the chamber, 1, from which they are easily removed through the opening, 6.

MARKET REMAINS STEADY

(Continued from page 341)

industrial and commercial centres. To understand better what happens, one need only contemplate how large groupings of enterprises in one part of the city have dissolved to re-group themselves more handy in better situated sections of New York.

New York Center of Business Shifting

So the engineering trades, formerly to be found on lower Broadway, have moved to the Grand Central Station district. The fur trades, the silk trades, the carpet trades, have shifted their location. There is, in fact, hardly one industrial group which did not seek and find a more suitable centre for the conduct of its affairs.

This all makes for the saving of time and energy. It makes the conduct of business more easy and more efficient.

It is in line with all the other organizatory work which is carried out today by representatives of industry and commerce and which all contributes to the stabilization of business during the last few years. This process of stabilization has progressed comparatively slowly. The start was made as far back as before the war with the formation of the Federal Reserve System. Further progress then was prevented by the war, and the following period of readjustment was hardly a time to permit trade and industry to settle down to a steady course of business building. But the war, while interrupting the progress of this work, also taught our business men the value and feasibility of organization. Once the beginning was made it was clear that this country would not return to the chaos of pre-war days. The readjustment period now definitely at an end was of importance, especially as providing an opportunity for trying out the experience of war-time organization on a peace-time basis. Now the world is rapidly returning to normalcy. Germany has apparently completely recovered from the economic effects of the war, and business is inclined to accept French debt protestations as just a form of domestic political window dressing behind which is the very concrete fact that France ultimately will pay. Somehow this matter of foreign debt settlement seems to have been closely connected with our own commercial credit situation. Its final accomplishment has added another prop to the foundations of the economic structure of the American market. It has for once had a very excellent effect upon foreign exchanges, which in turn has helped to steady prices in this country.

Stability Due to Federal Reserve System

Another reason for the stability of the present situation no doubt is the greater knowledge of the condition of the market provided by the supply of reliable market statistics. For this also the Federal Reserve System is responsible. Based upon its exceptional opportunities of receiving market news of the right kind, it has done much to familiarize business men with the needs for, and uses of, market statistics. The advantages of carrying on business by the aid of statistics carefully checked and presented in an easily readable form over mere hearsay information and opinion are obvious. To take a concrete example: Everybody knew that business had not been quite as good during January. But it needed the Federal Reserve Bank report on the conditions of the wholesale trade to bring home to the manufacturers and other business men the actual extent of this market movement. Wholesale trade activities declined not only as compared with the December of last year, which might easily have been expected, but also if compared with the condition of the market during January, 1926.

While this fact is worth while noting it is just as well not to put too much importance upon these figures. The market has been most active during the last two months of the year and the trade fully aware of this fact has done most wisely to return again to the safer system of buying for quick turnover.

Present Buying Methods Hard to Change

Manufacturers in the drygoods, textiles, and clothing lines are starting now to attack this system and try to change it. It is doubtful, however, whether they will succeed. Not only has the market accustomed itself to this method of buying but the rapid change in the character of merchandise forces the dealers to follow this policy as a matter of self-protection. The public has been educated today to expect frequent changes in styles. The manufacturer supplies the demand and the dealer must follow. Hand-to-mouth buying can only cease, therefore, when the manufacturers will stabilize the character of their merchandise. However, seen from a purely economic point of view, the present system of close buying is superior to any former and, therefore, its retention seems to be rather desirable. It is another feature in the reorganization of American business discussed above, which in the long run will make business better and more safe, even if at present it should work a little hardship in one or the other way.

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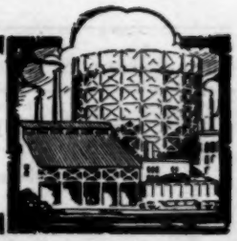
THE VERY IDEA!

"Say, Mister You do not want a home service expert, you want a cook." That is what one graduate from one of the teachers colleges told a gas man the other day when after he had looked up her references, studied the subjects she had taken and "thought he could use her at $100 per month." It does seem that a woman who is to be the home service expert for a big public service company should be worth a little more than an unskilled laborer employed by that same outfit at 75 cents per hour. The man who told us this story said; "these managers must be trying to put the home service department on a par with the sales department—and yet they wonder why they can't get good salesmen."

NEWS OF THE GAS INDUSTRY



Southern California Gas Company's Report Shows Net Income of Over Million Dollars

A net income of $1,118,028.49 was shown in the Southern California Gas Company's financial report for the year ending December 31, 1926, which was recently issued.

The condensed income account is as follows:

	Year ending Dec. 31, 1926
Gross Revenue	$9,806,578.73
Expenses, Taxes, etc.	6,999,785.50
Net Operating Income	2,806,793.23
Depreciation and Amortization .	632,767.87
Gross Income	2,174,025.36
Bond Interest and Other Deductions	1,055,996.87
Net Income	1,118,028.49
Dividends on Stock..	792,270.14
Surplus	325,758.35

The Southern California Gas Company is an associate of the Midway Gas Company, distributing gas received from the latter company's transmission lines. Commenting upon the annual report, Alexander B. Macbeth, executive vice-president of both companies, stated that, during the year 1926 the Southern California Gas Company gained 15,504 customers, making a present total of 183,576. A sum of $2,802,654 was expended in 1926 for extensions and betterments, bringing the total value of the company's property to $36,067,-879.71. Mr. Macbeth added that the year had been one of major developments in the company's system, among the most important of which was the construction of a ten-million-cubic-foot gas holder, of the new waterless type, in the southwest part of Los Angeles.

The Southern California Gas Company is one of the largest distributors of gas in the world, serving seventy-two communities through a distribution system of more than twenty-eight hundred miles of mains.

Precision Thermometer and Instrument Company's New Bulletin

Bulletin "D," 1927 edition, depicts and describes a number of measuring devices that should be of interest to the gas operating engineer. These include the "Precision" Gravitometer for indicating and recording the specific gravity of any gas passed through it, within an error of 0.005 Sp. Gr.; a compact and accurate tank gauge; Orsat Apparatus and Portable Boiler Tester, weighing 6 and 4 pounds respectively.

In addition to the above there are described single and multiple indicating draft gauges, micrometer draft gauges, and "U" and vacuum gauges.

The Bulletin is brief but ample in its description, well illustrated and a copy may be had upon request to Precision Thermometer and Instrument Company, Philadelphia, Pa.

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NATURAL GAS MAY BE BROUGHT TO GALVESTON

Gas Company Making Arrangements to Supply City

Galveston, Tex.—Galveston industries and residences may have natural gas fuel soon.

Arrangements to extend the line of the Houston Pipe Line Company to Galveston are being made by the Galveston Gas Company, it was announced by Ballinger Mills, attorney for the gas company.

The Houston Pipe Line Company now is extending its line from Alvin to supply Texas City industrial plants and the same line probably will be brought on to Galveston. Legal and financial details are being worked out now. Mr. Mills was unable to say what, if any, reduction in rate the natural gas will bring.

The pipe line is expected to reach Texas City by May 1.

Cincinnati Named for Gas Session

Cincinnati, O.—The annual convention of the Natural Gas Association of America will be held in the Music Hall buildings here, May 9 to 12 inclusive, according to announcement just made by Guy F. Batchelor, general secretary of the association.

The convention program now being planned will be of particular interest to Ohioans because of the fact that about one-third of all the natural gas customers in this country are located in the Buckeye State.

R. W. Gallagher, president and general manager of The East Ohio Gas Co., Cleveland, is president of the association.

Citizens Gas Co. Asks Authority to Issue Bonds

Indianapolis, Ind.—Authority to issue $121,000 in first mortgage bonds at not less than 90 per cent. of par was asked in a petition filed recently with the Indiana Public Service Commission by the Citizens Gas Company. The petition sets out that the returns from the bond sale are desired to reimburse the company for extensions and betterments made between July 1, 1926, and December 31, 1926, which total $134,294.67. This includes a cold storage plant costing $8,384.95 and a distributing system costing $109,594.49. To this would be added new meters installed at a cost of $2,054.13.

No Immediate Change in Engineering Courses At Johns Hopkins

Dr. Frank J. Goodnow, president of The Johns Hopkins University, has authorized the following statement in reference to the future of the School of Engineering:

"Much interest has been displayed in the new plan for university work at The Johns Hopkins University. This plan applies particularly to the philosophical faculty. For the present the School of Engineering will continue as formerly to offer its regular four-year undergraduate courses and graduate instruction. Only such changes in curricula will be made as are necessary to conform with the modified courses in the College of Arts and Sciences."

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INSULL CONCERN GETS MORE GAS PROPERTIES

Peru, Ft. Wayne and Other Distribution Lines Included

Indianapolis, Ind.—In an order passed by the Indiana Public Service Commission, the Northern Indiana Public Service Company, an Insull concern, received authority to buy properties of the Indiana Gas Transportation Company for $814,465 and the Peru Gas Company for $394,247, and to issue securities totaling $1,208,700 to finance the purchases.

Properties of the Peru Gas Company consist of a gas distribution system in the city of Peru, and those of the Indiana Gas Transportation Company include distribution lines from Fort Wayne to Bluffton, Wabash to Logansport and Lebanon to Frankfort, with a branch line from Kingsland to Decatur. The securities authorized are to consist of 7,000 shares of 6 per cent. preferred stock to be sold at not less than 87 per cent. of their par value and to produce $609,000 in cash, and 59,970 shares of common stock of no-par value, to be sold at not less than $10 a share, to yield $599,700 in cash. A fee of $3,021.75 was prescribed by the commission to be paid by the purchasing company before the purchase will be approved finally.

Convention Calendar

April

4-5—American Gas Association. Distribution Conference of Technical Section, Baltimore, Md.

6—Pennsylvania Gas Association. Annual meeting, Bellevue-Stratford Hotel, Philadelphia, Pa. G. L. Cullen, secretary-treasurer, Harrisburg, Pa.

7-8—Eastern States Gas Conference. Annual meeting, Bellevue-Stratford Hotel, Philadelphia, Pa. J. Calhoun Smith, secretary, Reading, Pa.

7-8—New Jersey Gas Association. Annual meeting, Bellevue-Stratford Hotel, Philadelphia, Pa. Louis Stoker, secretary, Newark, N. J.

19-22—Southern Gas Association. Annual meeting, Biltmore Hotel, Atlanta, Ga. J. P. Connolly, secretary, 141 Meeting Street, Charleston, S. C.

20-22—Midwest Gas Association. Annual convention, The St. Paul, St. Paul, Minn. H. R. Sterrett, secretary, 551 Seventh Street, Des Moines, Iowa.

26-29—Southwestern Public Service Association. Annual meeting, New Orleans, La. E. N. Willis, secretary, 403 Slaughter Bldg., Dallas, Texas.

May

5-7—Missouri Association of Public Utilities. Location to be selected later. F. D. Beardslee, secretary, 315 North Twelfth Street, St. Louis, Mo.

6-7—Pacific Gas Association. Northwest Regional Conference, Hotel Davenport, Spokane, Wash. Clifford Johnstone, secretary, San Francisco.

9-11 Natural Gas Association of America. Annual meeting, Cincinnati, Ohio. Guy F. Batchelor, secretary, 904 Oliver Bldg., Pittsburgh, Pa.

19-21—Indiana Public Utility Association. Annual meeting Gas Section, French Lick Springs Hotel, French Lick. E. J. Burke, secretary, 1270 Peoples Gas Bldg., Chicago, Ill.

25-28—New York Regional Sales Conference. Annual meeting, Lake Mohonk Mountain House, Lake Mohonk, New York.

31 & June 1—American Gas Association. Production Conference of Technical Section, Detroit, Mich.

Stacey Mfg. Co. Receives Order for A. G. A. Testing Laboratory Holder

Cleveland, O.—The American Gas Association has placed an order with The Stacey Manufacturing Company, Cincinnati, Ohio, for a 5,000 cubic foot capacity single lift holder for their testing laboratory at Cleveland, Ohio. This holder is designed for 12-inch pressure and is to be used in connection with the extensive work that is being carried on by the association under the able direction of R. M. Connor.

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Gas System Is Sold to Southern Counties Company

Santa Ana, Cal.—The Southern Counties Gas Company, serving a number of live communities in this section of the State, has just purchased the Huntington Beach municipal gas system for a consideration of $75,000. The transaction was for cash and the Southern Counties company has already assumed charge of the system.

The citizens of Huntington Beach voted to sell the system some time ago when oil was discovered in the town proper and when, by the opening of most of the town to oil drilling, it was found necessary to abandon several thousand dollars' worth of city gas lines and equipment in the oil section.

The money received from the sale of the gas system was used by the town to retire $47,500 worth of bonds still outstanding on the gas system and to retire bonds outstanding of $18,500 against the city auditorium and to retire $5,000 worth of bonds against the fire department.

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Hear Rate Plea

Clarksburg, W. Va.—The public service commission still is occupied in hearing the case of the Clarksburg Light and Heat Company, asking an increase in gas rates to domestic consumers. The hearing began recently.

Largest Gas Main Ever Laid in Brooklyn

Forty-eight Inches in Diameter and Weighs Over 1,000 Tons

Brooklyn, N. Y.—The largest gas main ever laid in Brooklyn has just been placed underground by the Brooklyn Union Gas Company. The big main which weighs 2,771,-711 pounds and is forty-eight inches in diameter is laid along Morgan Avenue to the new Greenpoint works which is being erected on the property recently acquired by the company.

This mammoth main will connect the new fifteen million cubic foot gas holder at the Greenpoint works with the remainder of the transmission system of the Brooklyn Union Gas Company, the connection being made at Scholes Street and Morgan Avenue. The total length of this main is 4,016 feet. The size of the main, forty-eight inches, is the largest transmission main ever placed underground in this territory.

Valves Each Weigh Over Seven Tons

The main consists of three hundred and fifteen lengths of cast iron pipe and twelve bends. Each section of the pipe is twelve feet long and each section weighs 8,077 pounds, lightly over four tons. The valves of this main are of mammoth construction. Each valve weighing more than seven tons or, to be accurate, 14,780 pounds. These valves are so geared that they can be operated easily.

In addition to the weight and size of the cast iron pipe placed underground, 51,000 pounds of lead and over one ton of yarn were used in making the joints tight.

An interesting fact was developed in the laying of the main. It appears that at some previous time beneath Morgan Avenue existed another business section. Parts of the main were laid over old roadways which were discovered far beneath what is now Morgan Avenue. Also parts of docks, and in one place a portion of a vessel were found showing that at some forgotten time another level of commercial life was maintained at this point.

The main is but the beginning of a mammoth plan of extension of the system of the Brooklyn Union Gas Company. The growth of Brooklyn and Queens has been so phenomenal that the company has anticipated the future growth by the installation of this large main and the great storage tank at Greenpoint.

Gas Use Increase Indicated By Survey

San Francisco, Cal.—A sharp upward curve of domestic gas consumption in California during the last winter, due to severe weather conditions, is indicated in a survey of the Glendale gas situation by E. C. Brown, gas engineer of the State Railroad Commission. While the increase attracted the most notice in Southern California, it is believed by rail board engineers that in varying degree the increase would hold for the entire State. Many Los Angeles people complained that increases in bills were due to the change to natural gas.

New Offices and Labor Saving Appliances Store for Lehighton

Lehighton, Pa.—Work has been started on the Meredith Building, 129 North First Street, which is being remodeled by a local contractor for the New Parryville Consolidated Gas Company.

The completion of changes planned will make the former Meredith Millinery Shop a thorough modern electric and gas appliance salesroom, adding a new store to Lehighton's business section. Local district offices of the company will also be located in this building.

Chemical Engineering Course at the University of Michigan Includes Study of Gas

There is open to seniors, who receive special permission, and graduates in the school of Chemical Engineering a course in Gas which includes the following:

Research relating to the manufacture, properties, and uses of coal gas, water gas, oil gas and producer gas.

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Merco Nordstrom Valve Co. Establishes Western Factory in Oakland

Oakland, Cal.—Growing demand nationally for plug valves for use in the gas and petroleum industries has necessitated the establishment of a western factory by Merco Nordstrom Valve Company, a subsidiary of The Merrill Company, the eningeering organization.

Machinery is being installed in the firm's new plant at the corner of 24th and Peralta Streets in Oakland, California, and production will begin soon. The company also manufactures valves at Belleville, N. J.

The western factory covers 30,-000 square feet and will have complete facilities to carry out manufacturing on a large scale.

Officers of the company are: Charles C. Broadwater, president; Sven Johan Nordstrom, vice-president; Herbert S. Shuey, secretary and treasurer, all of whom are directors of the company; the other directors being Charles W. Merrill and Louis D. Millers, the former president and the latter consulting engineer of The Merrill Company.

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Elmer E. Clay to Do Special Work in Bryan

Indianapolis, Ind.—Elmer E. Clay, manager of the Columbus Gas Company, Columbus, Ind., has left for Bryan, Ohio, where he will spend three or four weeks doing some special work for the holding company, which owns the Great Lakes Utilities Company. The latter company owns the gas utility at Columbus.